

OHIO RIVER AND TRIBUTARIES FROM BELOW HAWESVILLE, KY., TO THE MOUTH OF, BUT NOT INCLUDING, THE WABASH

By J. C. HAGAN

The 1937 flood actually saw its beginning the latter part of December 1936, when moderate to heavy rains began to fall over the entire Ohio River watershed. Moderate rises resulted over the entire Evansville district, with Evansville and Dam No. 47, Newburgh, Ind., being the first to pass flood stage, on January 10. Rains grew in intensity after the 10th, and soon all stations in the Evansville district were above flood stage.

With the 9th and 10th of January, there came a disaster, preceding a final and greater disaster, in the form of a glaze storm, destroying power and telephone lines, and halting traffic, caused by fallen trees and other debris. With an approaching flood, this condition was doubly serious, telephone lines to most of the key points along the river having been destroyed. Some of these stations were not heard from again until late in February.

Rains began again on the 14th, and continued for several days, resulting in the tentative stage forecast being raised from day to day; however, the forecast was always issued several days in advance of the stage. With the heavy rains of the 20th and 21st, tentative stages were forecast approximating the 1913 crests. Additional heavy rains on the 22d and 23d forced a new revision, with stages about 3 feet over the 1913 crests of the Ohio, and much higher stages than the previous extremes in the Green and Barren Rivers.

January 24 was the darkest day in the history of the Evansville Weather Bureau Office, started off with a complete absence of reports, causing the official in charge, McLin S. Collom, further worry, when he was already exhausted from an almost continuous grind since the 20th. Shortly before 11 a. m., Mr. Collom suffered a fatal stroke, succumbing at 11 a. m.

Stage reports, from upstream, began to arrive shortly after noon of the 24th, some of them having been 6 hours in transmission. At 4 p. m., using the meager reports available, a tentative stage forecast was issued for Evansville, as well as for other points in the district, for the latter part of the week. This forecast was given to the press and radio. Radio carried the burden of getting it across to the people, as practically all telephone and telegraph communication had been destroyed. Heavy rains continued until the morning of the 25th so that several slight revisions in the stage forecasts had to be made before a final forecast was arrived at. * * *

A second rise started at Cincinnati, Ohio, on February 10, with a total rise of 14.1 feet in 4 days; started at Louisville on the 11th, with a total rise of 9.9 feet in 4 days. It was not indicated that this rise would affect the Evansville district materially (stage had already receded to about 40.0 feet at Evansville). However, a rise of 1 to 2 feet occurred in the upper district, but from Owensboro, Ky., to Evansville, Ind., the rise was slight, while below Evansville the falling tendency was decreased. This continued fall is believed to be caused by the reason set forth in the following paragraphs.

The flood plain of the Ohio River begins to widen at Tell City, Ind., about 75 miles upstream from Evansville by river, and attains a width of about 25 miles near Evansville. The flood plain continues wide downstream to Uniontown, Ky.; below Uniontown, it begins to narrow again and at Carrsville, Ky., 80 miles below Evansville, a bottle neck is formed by the foothills of the Ozarks, which run across Illinois. This condition is general from Carrsville to well below Paducah, Ky., and valves the water to such an extent as to cause a "lake" to be formed in the lower Evansville and upper Cairo districts.

This valving, or damming effect, of the hills forced the water high enough to affect towns and cities, which had never had water before, some were 25 to 30 miles inland.

About January 25 a condition developed at Golconda, Ill., which is believed to have saved the "lake" section from a considerable higher stage; this was the breaking through of the Ohio River to the watershed of Cache River, which normally empties into the Ohio River a few miles upstream from Cairo, Ill. In this case, however, the Cache River overflowed the lowlands in the vicinity of Hodges Park, Ill., and emptied into the flood plain of the Mississippi River. This way, additional thousands of second-feet were permitted to pass Golconda, Ill., relieving the water faster from the "lake" area.

Further proof of the effectiveness of this break was shown in the continued fall of the river at Dams Nos. 49 and 50, following the 14-foot secondary rise at Cincinnati on February 10.

The histories of southern Illinois (Lansden's History of Cairo) state that at one time the Cache River was the original bed of the Ohio River; the channel, at this time, running west from Golconda, Ill., to the Mississippi River, about 15 miles upstream from Cairo, Ill. This section was visited and all indications are that this condition once prevailed. At that time, the history relates, the Cumberland River flowed into the Tennessee River at Paducah, Ky., and

followed the present course of the Ohio River to the Mississippi at Cairo, Ill.

From inquiry and personal observation in the Cache River section, an idea as to the volume of water that flowed through that section was obtained. On United States Highway 45, about midway between Vienna and Metropolis, Ill., it was noted that the water flowed over the highway at a depth of about 5 feet for more than a mile; the current in this particular section was described by natives as being too swift to navigate by boat, and that the condition did not last just a day, but continued for practically the entire duration of the flow through that section.

There is no doubt but that the Cache River cut-off lowered the stages in the Evansville district materially and resulted in a much faster run-off for the entire district, especially the Uniontown, Ky., area.

The cutting of the "fuse plug levees" in Missouri, just below Cairo, Ill., is also believed to have aided the lower Evansville district slightly, by permitting a more rapid flow.

One of the features of the flood at Evansville was the arrival of the Green River crest in the Ohio River, which could be seen in the action of the various gages. The crest of the Green River (mouth of Green is 6.5 miles below Dam No. 47) arrived just a few hours short of the Ohio crest, but in time to combine before they traveled past Evansville. On January 30, at 7 a. m. the river was falling at Dam No. 46 and had been stationary at Dam No. 47 for the past 12 hours. At 6 p. m., January 30, the river had again become stationary at Dam No. 46 and was rising at Dam No. 47. The crest of the Green River flowed into the Ohio late the afternoon of the 31st.

All means of transportation into Evansville were hampered by the water at its crest. Only one highway remained open, and it was covered with 1 foot of water. Another highway, State 66, was opened after many hours of placing sandbags and pumping by W.P.A. workers. The only railroad running, the Chicago and Eastern Illinois, had 17 inches of water over the track for a stretch of about a mile. This stretch was watched over by several hundred workers to keep it open. The airport was closed with 18 inches of water.

Most of the public utilities in the district were flooded out, adding further to the inconvenience of the people. Evansville, Ind.; Owensboro, Ky.; Mt. Vernon, Ind.; and Henderson, Ky., were able to maintain most of their utilities and so were major relief points for the district. A long hard battle was fought by the workers of water and power plants to maintain service.

Approximately a quarter of a million people were affected directly by the flood in the Evansville district (both Ohio and Green Rivers), of this number 90,360 were forced to evacuate their homes. A total of 22,040 homes were inundated in this district.

Three hundred and sixty-seven thousand acres of land were inundated in the Evansville district (Ohio and Green Rivers). Floods in the past have proven to be of benefit to the fertility of the lowlands, and did so in this case with sediment deposits of as much as 12 inches, but the value received on some lands was offset by the accumulation of sand in other sections.

Hundreds of acres were covered with sand, ranging from 1 to 8 feet in depth, entirely too deep for turning under. The heaviest deposits of sand are in Knight Township, Vanderburg County, upstream from United States Highway 41-S. The farmers are in hope that the next flood will leave a sufficient sediment deposit to reclaim this land.

The loss from prospective crops was very low, due to winter appearance of the flood. Only wheat and barley were affected to any extent. The wheat showed a return to life, following the recession of the water, but the barley was practically destroyed.

WABASH RIVER AND TRIBUTARIES

By J. H. ARMINGTON

The January flood in this district was "built up" by four successive periods of heavy rainfall, extending (nearly) over the 7th to 10th, 13th to 15th, 17th to 18th, and 20th to 25th; these following a period of moderately heavy rainfall during the latter part of December 1936, which caused flood stages at some points, and saturated the surface soil so that run-off was high with the first period of January rain.

No deep snow cover preceded this flood, as was the case in January 1930, and the moderate cover of 1 to 4 inches on December 19 had disappeared entirely by the 25th of that month. Nor was the cold spell of January 22 of sufficient severity to cause ice damage of consequence, as it did the former case, but the cold did add materially to the discomfort of those in the areas that were evacuated—chiefly the main White and extreme lower Wabash River sections. Also, this cold spell caused snow instead of rain on the 22d and 23d in the middle of the fourth precipitation period. The water content, ranging from about one-third inch over the upper West Fork

to nearly 1 inch over the East Fork, was released more slowly by melting during the following week, probably reducing somewhat the crests following, particularly in the East Fork and main White Valleys.

As was true through the entire State, there was a decided increase in the intensity of the rainfall in each of the four periods from north to south over the Wabash-White Basin. In the middle and upper Wabash Valley these amounts totalled well under previous January records at all stations; in the West Fork of White Valley the amounts were for the most part somewhat above previous January records; and over the East Fork of White Valley, the rainfall far exceeded that of any previous January at all stations.

The result of this distribution of rainfall was to produce a series of rises in the middle and upper channels of the Wabash and West Fork of White River, with the main crests occurring comparatively early, from the 16th at Bluffton, Ind., on the Wabash River, to the 19th at Edwardsport, Ind., on West Fork of White River; while the descending water from above and the heavier rainfall below caused a more continuous rise in the East Fork and main White, and the extreme lower Wabash River, to their crests later. At Williams and Shoals, Ind., on the East Fork, the crests occurred on January 25. Below, from Petersburg, Ind., on the White, to New Harmony, Ind., on the Wabash, crests were somewhat earlier—January 21 to January 24—most probably because of the serious breaking of levees in the Decker and Hazleton, Ind., sections. At New Harmony, Ind., on the Wabash River, about 50 miles above confluence with the Ohio, while the crest from upstream water was reached on January 24 and there was a slight fall on the following 2 days, a further rise occurred due to backing water from the Ohio River, the final crest being recorded on January 31.

Advices and warnings were issued frequently during the period to all river and distributing stations, and further distribution, was secured by the two Indianapolis radio stations WIRE and WKBF, and the radio station at Evansville, Ind., WGBF. The several State Police radio stations also assisted materially, not only in distributing the advices issued, but also in gathering data and reporting conditions from areas in which wire communication was interrupted. On numerous occasions the Indianapolis radio stations, particularly WIRE, interrupted their regular programs to send out information and warnings sent out by this office. It was necessary also in securing prompt distribution and in getting information for the Weather Bureau office at Indianapolis to call persons by long distance telephone; and calls by telephone from all parts of the river district were frequent throughout the flood period. * * *

At Decker, Ind., the old gage used by the Weather Bureau until the installation of the gages at Hazleton and Petersburg, Ind., showed the crest of the flood at that place to be 30 feet on January 21. It is 1 foot higher than any crest previously observed (29.0 feet in January 1930) and exceeded by 1.2 feet the crest of the flood of March 1913. There is no doubt, therefore, that the White River in this flood of January 1937 experienced the highest water of record along its whole course. This is further borne out by the excessive flooding in the Hazleton, Ind., area, which necessitated the evacuation of many families and damaged considerably the approaches to the highway bridge on Road No. 41, and did some damage to the bridge itself.

It will be noticed that, while the flood in the main White was without doubt higher than any previously known flood, the stages in the Wabash below at Mount Carmel, Ill., were 4 feet below the 31.0 crest of March 1913. This is due to the fact that there was not so much water upstream in the Wabash channel in this year's flood, as well as to the breaking of levees on the White, which slowed down the rush of water from that stream into the Wabash River.

Damage and loss were very severe in the White section below junction of the forks, and in the extreme lower Wabash stretches, but were only moderate to light in the middle and upper channels of the basin.

CUMBERLAND RIVER AND TRIBUTARIES

By R. M. WILLIAMSON

Heavy rainfall over the Cumberland River Basin during the night of January 1 averaged approximately 2.50 inches; several stations reported in excess of 4.00 inches. This occurred on a rising river bringing an immediate flood at Celina, Tenn., before 7 a. m. and flood warnings were issued at 8:30 a. m., January 2, for all points from Burnside, Ky., to Nashville, Tenn.

The damage from this flood was comparatively light. However, a second flood was in progress shortly after the middle of the month, much more serious than the first.

The actual crests reached in this second flood are given in the table below for a number of points, and comparison is made with the previous high records. The rank as to highest will drop to fourth place for Celina, Tenn., and third place for Carthage, Tenn.,

if the flood of January 1882 (which occurred before these stations were established) is considered.

Station	Length of record (years)	Crest January 1937	Rank as to highest on record	Previous record	Year
Burnside, Ky.	53	54.3		69.4	1929
Celina, Tenn.	34	53.6	Third	57.1	1926
Carthage, Tenn.	52	54.6	Second	58.7	1926
Nashville, Tenn.	63	53.8	Third	56.2	1927
Clarksville, Tenn.	34	65.5	First	60.0	1927
Eddyville, Ky.	20	76.9	do.	68.5	1927

¹ 57.5, January 1882.

² 56.5, January 1882.

³ 60.6, January 1882.

OHIO RIVER BELOW THE MOUTH OF THE WABASH; MISSISSIPPI RIVER FROM AND INCLUDING CAPE GIRARDEAU, MO., TO AND INCLUDING NEW MADRID, MO.; TENNESSEE RIVER AND TRIBUTARIES BELOW DECATUR, ALA.

By W. E. BARRON

After several months of comparatively low water, in which some unusually low stages were reached, a general rise began in the Ohio River during the last week of December 1936 and developed within 1 month's time into the greatest flood of record.

The flood was caused almost entirely by excessive rains over the drainage area of the Ohio River and its tributaries, including the three largest, the Wabash, the Cumberland, and the Tennessee Rivers. There was practically no snow on the ground at the beginning of the month and whatever amounts fell subsequently were absorbed in the general rains or floods, and had no particular influence on the stages of the river.

The table shows successively the amount of precipitation at various reporting stations for the periods January 1-10, 11-18, 19-25, together with the totals for the 25 days.

Table showing precipitation in inches by periods: January 1-25, 1937, for selected stations, Cincinnati, Ohio, to New Madrid, Mo. (Daily measurements, 7 a. m. or 8 a. m., seventy-fifth meridian time.)

Station	Jan. 1-10	Jan. 11-18	Jan. 19-25	Total, 25 days
Cincinnati, Ohio	1.70	4.56	7.25	13.51
Louisville, Ky.	3.35	4.94	10.30	18.62
Evansville, Ind.	1.90	5.07	7.34	14.31
Dam No. 48	1.81	5.70	7.81	15.32
Dam No. 49	2.89	5.96	8.43	17.28
Shawneetown, Ill.	3.38	6.36	9.20	18.94
Dam No. 50	3.53	4.00	9.71	17.24
Dam No. 51	3.88	4.53	9.99	18.40
Paducah, Ky.	3.76	2.75	10.64	17.15
Dam No. 52	4.48	3.98	10.87	19.03
Dam No. 53	3.66	5.38	8.55	17.59
Cairo, Ill.	3.33	3.87	7.91	15.11
New Madrid, Mo.	2.82	2.30	8.34	13.46

Rain periods along the Cumberland and Tennessee Rivers coincided roughly with those along the Ohio River. The Cumberland River reached 45.3 feet at Nashville, Tenn., on January 8, then receded to 24.0 feet on January 13, after which the almost daily rains brought the stage to 53.8 feet on January 26. This was an important contributing factor to the flood of the lower Ohio.

Along the Tennessee River the rainfall from December 30, 1936, to January 3, 1937, was 5.60 inches at Chattanooga, Tenn.; 5.73 inches at Guntersville, Ala.; 3.92 inches at Decatur, Ala.; 3.64 inches at Florence, Ala.; 3.07 inches at Riverton, Ala.; 5.44 inches at Savannah, Tenn.; and 1.70 inches at Johnsonville, Tenn. At the same time there were equally as heavy rains on the Elk River, which flows into the Tennessee a few miles above Wheeler Dam, and on the Duck River, which joins the Tennessee 14 miles above Johnsonville, Tenn. The rains and upriver discharges produced 33.0 feet at Chattanooga, Tenn., on January 4; 32 feet at Guntersville, Ala., and 23.2 feet at Decatur, Ala., on January 7; 19.6 feet at Florence, Ala., on January 6; 40.3 feet at Riverton, Ala., on January 7; 40.1 feet at Savannah, Tenn., and 32.0 feet at Johnsonville, Tenn., on January 8. Subsequent rains from January 9 to 25, inclusive, were as follows: Chattanooga, 5.76 inches; Guntersville, 7.50 inches; Decatur, 7.76 inches; Florence, 7.32 inches; Riverton, 5.60 inches; Savannah, 8.55 inches; Johnsonville, 21.97 inches. These rains were so distributed in point of time as to produce two